

WASHINGTON

# SCIENCE TRENDS

HIGHLIGHTS

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## \* NAVY SPACE SYSTEMS

The Navy has advised Congress that it has established operational requirements for the following space systems, among others:

- ✓ High accuracy navigation system using artificial earth satellites (Transit)
- ✓ Communication satellite relay system
- ✓ Electronic reconnaissance satellite
- ✓ Reconnaissance/Surveillance satellite system
- ✓ Naval weather satellite system
- ✓ Satellite survey system
- ✓ Antisatellite weapons systems
- ✓ Air/Sea launch system for satellite payloads
- ✓ Sea-based manned maneuverable interceptor spacecraft weapon system
- ✓ Satellite detection and reconnaissance defense system

## \* SPACE TELECOMMUNICATIONS

The Senate Space Committee, headed by Vice-President elect Lyndon Johnson calls for a "unified policy" in space communications, typified by the Echo, Score and Advent-Courier satellite systems. An outstanding survey of the many problems in this field has just been completed.

The Senate group also requested and received further details on NASA Administrator T. Keith Glennan's proposal which appeared to indicate that the Government would turn over, on a "cost-reimbursable basis" Government-owned facilities to private companies interested in establishing a space communications network.

Glennan, in a November 23 letter now made public, declared:

"The proposal appears to NASA to be desirable if the early achievement of commercially viable communication satellite systems is to be realized. The proposal does represent approved policy, but any final action in this regard will most certainly have specific approval before funds or other legislative actions are requested."

He added that existing legal authority "appears sufficiently broad" to cover such actions and that his agency does not now plan to go to Congress "for the specific purpose of facilitating this proposal."

In general, Glennan states:

"In view of the heavy expenditures required for a vigorous space exploration program, and in the light of the complexities of this new environment which requires a broadly based program, two conclusions are inescapable: First, that NASA's program should stimulate those developments which promise early economic benefits to our citizens, and second, that cooperative efforts between Government and industry in space activities should be encouraged whenever possible."

\* RESEARCH AND DEVELOPMENT OPPORTUNITIES

The Bureau of Naval Weapons, Washington 25, D. C. is seeking firms which have research and development capabilities in the following fields:

✓ Flashblindness Protection Systems

Such systems are designed to prevent loss of vision of personnel in aircraft in case of nuclear exposure. Facilities and personnel must include intensive knowledge of physics, physiology, psychology, human factors, optical shop technology and engineering design.

(Complete information should be furnished to Chief, Bureau of Naval Weapons, Washington 25, D. C. ATTN: RAAE 232.)

✓ Lightweight Aircraft Marine Marker Retro Launcher

Details are not available on this requirement. Interested firms are invited to submit complete information to The Chief, Bureau of Naval Weapons, Washington 25, D. C. (ATTN: RAAV-34.)

✓ Advanced Concepts, Direct Conversion of Energy into Electrical Power

This requirement covers thermoelectricity, magnetohydrodynamics, thermionics fuel cells, high energy batteries and high efficiency regulation systems needed for direct conversion voltage control.

(Complete information should be furnished to the Chief, Bureau of Naval Weapons, Washington 25, D. C. ATTN: RAAE 232.)

\* COATED PARTICLE NUCLEAR FUEL

Atomic Energy Commission has asked the Battelle Memorial Institute to conduct a three-year study of the so-called coated particle nuclear fuel concept. Objective is development of coated particles with high temperature properties, fission product retention capability and good neutron economy.

In this process small grains of fissionable nuclear fuel compound are coated individually with a dense, refractory material. The purpose is protection of the fuel from damage by chemical reaction at the high temperatures of the nuclear reactor, and prevention of troublesome radioactive byproduct escape.

Previous work at Battelle indicates the use of carbon or alumina coatings. After coating, the fuel particles are evenly dispersed in a material such as graphite, which can be conveniently shaped into reactor fuel elements by mass production methods.

AEC Comments: "Such a fuel appears particularly attractive for high temperature operation because only non-metallic refractory materials are utilized. In contrast, presently used fuel elements are temperature limited by metallic cladding. In addition, good neutron economy can be expected from coated particle fuels."

(The program also provides for evaluation and testing of commercially produced coated particles. Interested manufacturers should contact Dr. R. W. Dayton, Battelle Memorial Institute, Columbus, Ohio for information about this evaluation program.)

\* OPPORTUNITIES IN COAL RESEARCH

The U. S. Department of Interior is inviting proposals from a variety of organizations to take part in programs to be sponsored by the new Office of Coal Research. Basic objective in such projects is "short-range" results which may have an immediate economic impact on the nation's lagging coal industry. Organizations which may have had no prior connection with coal studies may find new contract opportunities here.

Here are some pointers from Royce A. Hardy, Assistant Secretary, Department of the Interior, Washington 25, D. C. :

✓ Many Proposals Expected -- "We expect to receive numerous proposals from State mining bureaus and economic departments, universities, nonprofit research organizations, research organizations of private coal companies, research organizations of companies consuming coal, manufacturers of equipment used by the coal industry, trade associations and other organizations..."

✓ Factors to be Considered -- Among the factors to be considered in assessing the various proposals are: present knowledge in the particular field under consideration, the purpose of the project, anticipated technical results, time estimated to bring the project to a successful conclusion, the technical and scientific approach to be used, description of the methods and tools to be used, and estimated cost. Above all, however, is the economic impact that the successful conclusion of a project might have on the coal industry.

✓ How Proposals will be Judged -- The most attractive proposals will be those that promise to improve coal's economic position most rapidly. One of the ways this might be done is by delivering a better and lower cost product that can be used in markets competitive with other fuels. Projects aimed in that direction will "receive sympathetic consideration." Even more appealing, it is said, are projects which may aid in revealing and expanding the use of coal in "those areas where it is uniquely suited." Practicality will also be judged -- whether a proposal can be translated into practice if the research project were successful and whether it is economical to do so. It will have to decide also the scientific and technical feasibility of solving the problem, and whether manpower and equipment are available for carrying out the project.

The Office of Coal Research will also "keep in mind" the impact of its program on different geographic areas, and will have to maintain a balance between applied and development research, between research on bituminous, lignite and anthracite, between scientific and economic projects, and among the types of organizations conducting the research.

✓ Contract Selection and Administration -- The Office of Coal Research does not promise to arrange contracts for a research program with the person or organization that presented the original proposal. It is explained that "there may be times when a proposal will come from a company or organization that would have to make large equipment purchases to carry out its proposed program. If this equipment is available in another research organization doing the work, the contract -- other considerations being equal -- might go to the second party."

Financing will generally follow general Governmental procedures. However, some projects may be so costly that cooperative financing may be desirable. Possibly, too, there may be occasions when the proposing organization may itself desire to contribute part of the cost. It is stated that joint participation of this kind will have the effect of extending and increasing the total amount of coal research done, and also might insure a greater interest in bringing a project to successful conclusion.

(For further information write Office of Coal Research, U. S. Department of the Interior, Washington 25, D. C.)



## TECHNICAL TRENDS

- The Air Force has ordered "extreme caution" during the fueling and defueling of all Bomarc IM-99A missiles after finding that a number contain JP-X fuel tanks with misaligned tank fittings. Inspection procedures have not been developed to spot the faulty missiles. ✓✓ The National Academy of Sciences is accepting applications for fellowships and grants in the field of radiological research. Details are available from the Academy's Committee on Radiology, Washington 25, D. C. ✓✓ The National Aeronautics and Space Administration this week publishes a pioneering (1925) study by Walter Hohmann of Germany on "The Attainability of Heavenly Bodies." Copies are available through NASA channels or at \$2.50 from OTS, U. S. Department of Commerce, Washington 25, D. C.
- Aerojet-General Corporation, Azusa, California has won a nine-way contest for an Air Force contract to study and design criteria for an integrated data handling system at the Directorate of Rocket Propulsion and Missiles. ✓✓ Army Ordnance has awarded \$109,000 to American Electronic Laboratories, Philadelphia for design and fabrication of prototypes of an automatic transistor tester. ✓✓ Employment of scientists and engineers in industry rose nearly 7 percent between January 1959 and January 1960, according to the National Science Foundation. A complete report will shortly be available. ✓✓ The Atomic Energy Commission has established new base charges for plutonium distributed by the Commission for commercial-industrial purposes. These will range from \$30 to \$45 per gram. Details of these and other changes are available from the Information Office, AEC, Washington 25, D. C. Ask for Announcement C-239.
- Bendix-Pacific, North Hollywood, California is developing a helicopter radar system designed to seek out submarine periscopes and snorkel tubes. Two prototypes will be built for the Navy's Sikorsky HSS-2 helicopters. ✓✓ The Christy Corporation, Sturgeon Bay, Wisconsin has won a \$4.5 million fixed price contract for construction of two oceanographic research ships -- the lowest of 14 proposals. The vessels will be operated by the Navy's Military Sea Transportation Service, but will be manned by civilian crews. Each of the AGORs will have a full load displacement of 1,370 tons. ✓✓ Charles F. Yost, Director of Solid State Sciences, Air Force Office of Scientific Research, has been appointed Assistant Director for Materials Sciences, Advanced Research Projects Agency, Washington 25, D. C. ✓✓ "Minor corrections" in the water system have prevented the Air Force from making a complete acceptance of Test Stand 1-B at Edwards Air Force Base, California. The stand, costing close to \$7 million will be used to test the F-1 million and a half pound thrust engine for the National Aeronautics and Space Administration. It will later be "beefed up" to hold a cluster of four of the Rocketdyne engines.
- U. S. manufacturers shipped some \$59.7 million in electrical measuring instruments during the second quarter of 1960 -- up some \$5.6 million in three months. Details are available in Announcement BD-60-205, Information Office, Business and Defense Services Administration, Washington 25, D. C. ✓✓ The same office has available BD 60-207 detailing sharp increases in still and movie camera imports for the first nine months of this year. ✓✓ Col. Horace W. Lanford, Jr., Director, Electronics Production Resources Agency hopes to have available by July a 5-year forecast of military requirements for 13 categories of electronic components. ✓✓ The Information Office, National Science Foundation, Washington 25, D. C., ATTN: Mr. Clyde Hall, now has available copies of the November 20 report by the President's Science Advisory Committee on problems of basic research and graduate education.



## RESEARCH CHECKLIST

- AUTOMATIC TEMPERATURE RECORDING: Studies at the National Bureau of Standards have resulted in development of a device which automatically and continuously records small temperature changes with high accuracy and precision. The device, designed specifically for use in observing time temperature cooling curves of very nearly pure substances, may also have other applications. Principal components are a platinum resistance thermometer, a modified Mueller Wheatstone bridge, a direct current amplifier, and a potentiometric strip chart recorder. Recommended use is in experimental systems where the maximum temperature range to be recorded is less than one degree and the greatest range of temperature change is  $0.002^{\circ}\text{C}$  per minute.
- (R&D by G. S. Ross and H. D. Dixon. Details reported in Reprint Paper 64C4-45 available from National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)
- HYPERBOLIC COORDINATE CONVERTER: Studies by Motorola Inc., Scottsdale, Arizona for the Federal Aviation Agency have established recommended design principles for a practical airborne computer that would accept the hyperbolic information available from present low-frequency navigational aids and convert it to a form better suited for air traffic control and general navigation. The suggested device could be packaged in 0.5 cubic feet; would weigh less than 25 pounds; and could be integrated into a complete flight control system without extensive additional equipment.
- (Report available through FAA channels or at \$3. from OTS, U. S. Department of Commerce, Washington 25, D. C.)
- SPACECRAFT COATINGS: Complete ultraviolet stability is claimed for a new compound developed by the Air Force. Research in the field of coatings has been directed toward organic coatings with a high order of ultraviolet and thermal resistance in a vacuum, and toward synthetic additives which can protect or stabilize organic coatings. Studies now indicate that both objectives may be met by ferrocene derivatives, a class of metallo-organic "sandwich" compounds. Preliminary results indicate that this material is the first to have complete ultraviolet stability, and may form a building block for plastics and coatings suitable for very long exposure, such as a space station.
- (R&D reported by Robert M. Van Vliet, Wright Air Development Division ((WRCNE-2)) Wright Patterson Air Force Base, Ohio.)
- RADIOMETER FOR ICEBERG DETECTION: The U. S. Coast Guard is testing a radiometric device which is expected to provide a higher probability of detecting icebergs under all weather conditions than visual and radar methods of detection now used. Using the principles of microwave radiometer, the device collects thermal energy from the surface being scanned and presents temperature differentials between icebergs and sea water as voltage changes on an output recorder.
- (R&D reported by AC Spark Plug Division of General Motors Corporation, Milwaukee 1, Wisconsin.)
- NEW HYDRAULIC CYLINDER: The Army has developed a special hydraulic cylinder to withstand rugged and continual use at an operating pressure of 3500 psi. The cylinder replaces a commercial tie-rod end cylinder and was developed especially for use in the armored vehicle launched bridge or "scissors" bridge for Army field use. The bridge replaces tie-rods with caps which are screwed onto the cylinder tube, instead of being held in place by rods.
- (R&D reported by Technical Liaison Office, U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Virginia.)

## P U B L I C A T I O N      C H E C K L I S T

- ☐ FUNDAMENTAL CHEMICAL RESEARCH, a directory of Research in Chemistry of a fundamental nature within or for the U. S. Army Ordnance Corps. Up to date as of August, 1960. Does not detail the scope of the studies listed, although information may be available from the appropriate research office. 18 Pages. Single Copies Free. (Write Scientific Information Office, Office of Ordnance Research, Box CM, Duke Station, Durham, North Carolina.)
- ☐ HIGH LOADING RATES IN MATERIALS, the proceedings of an Ordnance-sponsored conference held in March, 1959 on high load or strain rates in such materials as steels, thermoplastics, and others. 247 Pages. Single Copies Free. (Write Scientific Information Office, Office of Ordnance Research, Box CM, Duke Station, Durham, North Carolina.)
- ☐ SOVIET COSMIC RAY RESEARCH, a brief report which asserts that Soviet efforts do not have the "breadth, flexibility and imagination" of the Western efforts in this field. 5 Pages. 50 cents. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for Report 60-21922.)
- ☐ ARMY COMBAT VEHICLES, a highly critical report concerning Army procurement of the M48 and M48A1 medium tank and its various misadventures. Single Copies Free. (Write Committee on Armed Services, U. S. House of Representatives, Washington 25, D. C. for Subcommittee Report No. 74, Development and Procurement of New Combat and Tactical Vehicles.)
- ☐ HYDROELECTRIC COSTS, a new supplement listing data on 298 hydroelectric plants. Shows cost of plant, production expenses, statistics on plant capacity, plant output and characteristics. 60 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for "Hydroelectric Plant Construction Cost, 1959 Supplement".)
- ☐ NONDESTRUCTIVE TESTING IN THE MISSILE INDUSTRY, a symposium on the many test methods required for missile materials including ultrasonics and radiography. 71 Pages. \$2. (Write American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania for Publication STP 278.)
- ☐ GAS IN EUROPE, a report dealing in detail with the gas industry of Western Europe, including an analysis of the competitive position of gas as compared with other forms of energy and a discussion of importing natural gas from overseas countries. 160 Pages. \$2. (Write Publications Office, OEEC, 2 rue Andre Pascal, Paris 16 France for Gas in Europe, 1960.)
- ☐ RADIATION PROTECTION CRITERIA AND STANDARDS, a summary-analysis now available of Congressional hearings on this subject held in May and June, 1960. 71 Pages. Single Copies Free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D. C.)
- ☐ SPACE VEHICLE NOISE, a technical report on noise measurements related to the static firing, launch and exit flight phases of the Project Mercury test program. 13 Pages. Single Copies Free. (Write National Aeronautics and Space Administration, 1520 H Street, N. W., Washington 25, D. C. Attn: Code BID, for Technical Note D-450.)
- ☐ REINFORCED PLASTICS, a manual providing instructions and illustrations on preventive maintenance and repair procedures for reinforced plastic laminated structures. 36 Pages. 30 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication 47x-1960.)

## Research and Development Directory

### Ø OFFICE OF NAVAL RESEARCH (Basic Research) -- continued

Additional information on Office of Naval Research activities may be obtained from the following branch offices:

Office of Naval Research Branch Office  
495 Summer Street  
Boston 10, Massachusetts

Telephone: Liberty 2-5100, Ext. 270

Office of Naval Research Branch Office  
346 Broadway  
New York 13, New York

Telephone: Rector 2-8000,  
Ext. 156 or 157

Office of Naval Research Branch Office  
1030 East Green Street  
Pasadena 1, California

Telephone: Sycamore 5-5971

Office of Naval Research Branch Office  
1000 Geary Street  
San Francisco 9, California

Telephone: Prospect 6-4312

Office of Naval Research Branch Office  
The John Crerar Library Building  
86 Randolph Street  
Chicago 1, Illinois

Telephone: Central 6-4288

Contract Administrator Southeastern Area  
Office of Naval Research  
2110 G Street, N. W.  
Washington 7, D. C.

Telephone: Sterling 3-4539,  
Ext. 60 or 61

### Ø BUREAU OF NAVAL PERSONNEL

Personnel Research Division  
Capt. S. W. Gavitt, Director  
Room 3735, Arlington Annex  
Washington, D. C.

Telephone: Oxford 4-2451

### Ø BUREAU OF MEDICINE AND SURGERY

#### RESEARCH DIVISION

Rear Adm. C. B. Galloway  
Room 7109, Building 7  
Potomac Annex  
23rd and E Streets, N. W.  
Washington 25, D. C.

Telephone: Oxford 6-2836

### Ø BUREAU OF YARDS AND DOCKS

Interests - Construction Materials, Special Purpose Transportation, Equipment and Materials against Atomic, Biological and Chemical Warfare.

#### RESEARCH AND DEVELOPMENT DIVISION

Capt. L. N. Saunders, Jr.  
Room 2B65, Yards and Docks Annex  
Memorial Drive and H Road  
Arlington, Virginia

Telephone: Oxford 7-7238



Research and Development Directory

Ø NAVAL RESEARCH LABORATORY

Interests - Materials, Electronics, Nucleonics.

Dr. R. M. Page, Director of Research  
4555 Overlook Avenue, S. W.  
Washington 25, D. C.

Telephone: OXford 7-7238

Ø NAVAL ORDNANCE LABORATORY

Interests - Basic and applied research in physics, chemistry, aeroballistics, and mathematics -- in areas that relate to weapons. Development and evaluation of weapons (underwater, air-and-surface) both conventional and nuclear.

Dr. D. F. Bleil, Associate Director for Research  
Naval Ordnance Laboratory  
White Oak Maryland

Telephone: HEmlock 4-7100, Ext. 574

Ø NAVAL PROPELLANT PLANT

Interests - Propellants, high explosives, ammunition.

Commanding Officer  
U. S. Naval Propellant Plant  
Indian Head, Maryland

Ø APPLIED PHYSICS LABORATORY

Operated under contract by Johns Hopkins University. Research in guided missiles and components, satellites, basic research.

E. L. Birts, Supervisor of Purchasing  
Applied Physics Laboratory  
8621 Georgia Avenue  
Silver Spring, Maryland

Telephone: JUniper 9-7700

D. J. Smith, Supervisor of Contracts  
Applied Physics Laboratory  
8621 Georgia Avenue  
Silver Spring, Maryland

Telephone: JUniper 9-7700

Ø NAVAL WEAPONS LABORATORY

Interests - Research development, test and evaluation in computation, data processing, ballistics, warhead characteristics, and missile safety systems.

B. R. Brumfield, Purchasing Agent  
Naval Weapons Laboratory  
Dahlgren, Virginia

( End of Navy Section )

